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A STUDY OF INDUSTRIAL WASTE POLLUTION IN
THE SOUTH PLATTE RIVER BASIN. APPENDIX D.
MEAT INDUSTRY WASTE STUDY. SUPPLEMENT
TO BASIN REPORT

Federal Water Pollution Control Administration
Denver, Colorado

December 1966

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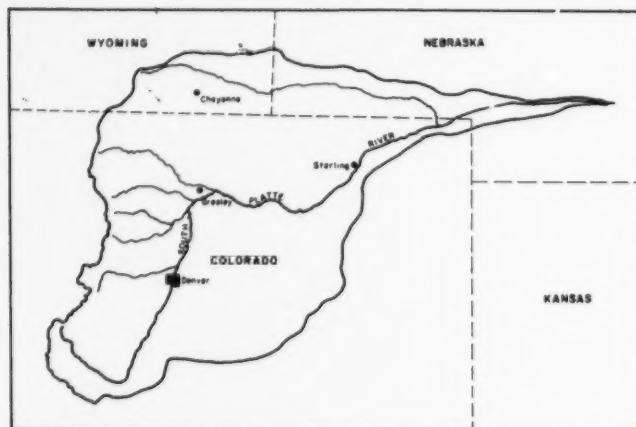
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APPENDIX D - MEAT INDUSTRY WASTE STUDY

Supplement to the Basic Report -

A STUDY OF INDUSTRIAL WASTE POLLUTION IN THE SOUTH PLATTE RIVER BASIN



U.S. DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration
South Platte River Basin Project
Denver, Colorado

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Appendix D - Meat industry waste study,
supplement to the basic report - a study
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APPENDIX D - MEAT INDUSTRY WASTE STUDY

Supplement to the Basic Report -

A STUDY OF INDUSTRIAL
WASTE POLLUTION IN THE SOUTH
PLATTE RIVER BASIN

U.S. DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration
South Platte River Basin Project
Denver, Colorado

DECEMBER 1966

I

APPENDIX D

A two and one-half year Industrial Waste Survey in the South Platte River Basin was culminated by the Federal Water Pollution Control Administration, South Platte River Basin Project in late 1966. The highlights of this Survey together with major recommendations on pollution abatement by industry are given in the basic report entitled "A Study of Industrial Waste Pollution in the South Platte River Basin." The Appendices shown herein represent a supplementary issue to the main report. However, these Appendices are essential to an understanding of the main survey and the primary document. The reader is encouraged to make full use of the four Appendices which have been prepared as four separate and additional reports and contain a wealth of information on the industrial waste picture existing within the Basin.

Appendix A gives pertinent information on the waste problems of 58 industrial companies. These plants were all visited but no waste sampling was undertaken by personnel of the South Platte River Basin Project. Appendix B presents detailed data on the waste handling and abatement procedures employed by 33 specially-selected industrial companies together with waste sampling results. In Appendices A and B, separate survey reports have been prepared for each of the 91 companies covered by the study. Appendix C provides the location and description of 639 outfalls, pipes and ditches representing potential or real sources of contributory pollution to Basin streams. These outfalls receive industrial wastes from one or more industries which could not be readily identified. Waste sampling was undertaken on 74 of these outfalls and all results are shown. Appendix D contains the results of a special study on the waste disposal problems of the meat industry within the Denver Metropolitan Area.

Appendix D included under this cover and entitled "Meat Industry Waste Study" constitutes a short but informative report on the status and waste disposal problems of the meat industry in the Denver Metropolitan Area. The survey was carried out primarily in the fall of 1964. This study is especially pertinent to the particular companies included, but also is of real value to the various sewage treatment plants receiving and treating these meat processing wastes. The Denver Northside Sewage Treatment Plant has in the past, and the Metropolitan Denver Sewage Disposal District No. 1's facilities will in the future, experience serious operational problems if large and uncontrolled volumes of paunch manure and grease continue to be discharged to these installations.

The City and County of Denver and other authorities have been relatively slow in recognizing the gravity of this problem and imposing necessary restrictions on the types and amounts of waste received from

meat processing establishments. The unavoidable solution lies in extensive on-site waste recovery and separate disposal of particular wastes to be provided by the meat companies together with necessary pre-treatment for remaining wastes before discharge to the municipal sewers. Direct release of processing effluents to a receiving stream does not appear at this time to be a reasonable solution. Uncontaminated cooling water may be permitted entry to the stream at one or more sites, but only after full evaluation has been made in each instance.

APPENDIX D - MEAT INDUSTRY WASTE STUDY

SUMMARY AND CONCLUSIONS

A study was conducted in the Fall of 1964 to determine the degree of treatment and nature of waste disposal provided by the meat industry within the Denver Metropolitan area. Certain municipal sewage treatment installations have in the past experienced considerable difficulty in handling and treating meat processing wastes. Omaha, Nebraska is a foremost example. The specific objectives of the study were to assess the amounts of paunch content wastes, the particular in-plant treatment measures employed by the establishments, and the means of final waste disposal. The information obtained from interviews, visual findings, and other sources is tabulated in five separate tables in this report.

The meat industry includes 20 separate plants and the Denver Union Stockyard Company. The paunch contents at 13 establishments are in the order of 125 tons per day. The study strongly indicates that under normal operating procedures, 50 percent or more of the paunch contents are discharged to the various sanitary sewers, and the remainder is disposed of to local fertilizer companies and farmers. The very important problem of paunch manure to the municipal sewage treatment plants in the Denver area as of late 1966, had not been solved.

Manure in the livestock holding pens of the meat plants in the Denver area exclusive of feedlot operations, accumulates at the rate of 200 tons per day. This waste material is collected and delivered to local fertilizer companies or to farmers. Spent livestock drinking water is discharged to the South Platte River from two plants. Substantial improvement should be made in disposing of solid and liquid wastes from the livestock holding pens.

Three companies with rendering facilities dispose part or all of their wastes from this operation to the South Platte River. Twelve of 15 meat plants provide some form of grease removal and recovery. However in a great number of cases, these facilities were found to be marginal with excess grease released to the sanitary sewers, and in three instances to the South Platte River. The overall grease removal picture needs substantial improvement.

DESCRIPTION AND BACKGROUND

In the meat industry, slaughterhouses provide for the killing of animals and the trimming, washing, and cooling of carcasses. Packing-house operations comprise slaughtering together with various processing procedures, and generally include rendering. Processing plants receive carcasses and provide meat cutting, curing, smoking, pickling, sausage

manufacturing, and meat canning. Rendering consists of cooking edible and non-edible materials in order to obtain a variety of useful by-products.

The meat industry within the Denver Metropolitan area includes 10 slaughterhouses, 3 packinghouses, 4 processing plants, 2 rendering plants, and one blood-dehydrating operation. The principal market and holding area serving this industry is the Denver Union Stockyard Company.

Major waste products from meat packing operations include paunch contents, grease, fat particles, blood, meat and bone scraps, and manure from holding pens. These wastes are somewhat similar in composition to domestic sewage but however are usually characterized by much higher waste strength and grease content.

The paunch contents are the partially-digested feed and manure found in and removed from an animal's stomach upon slaughtering. In cattle, the wet weight of the paunch contents is reported to range from 55 to 70 pounds per 1,000 pounds live weight (1). If the animal is not fed for 24 hours prior to slaughter, the weight of the paunch contents will be reduced to about one-third the values expressed above. The weight of paunch contents employed directly in the report is based upon actual tests that were conducted in Denver. These tests performed by plant personnel of the Cudahy Packing Company consisted of weighing several freshly-removed paunches from both cattle and hogs. The average wet weight for beef was 60 pounds per 1,000 pounds live weight, and for hogs was 4 pounds per 250 pounds live weight.

The amount of excreta obtained from animals is more or less proportional to live weight. Estimates of the wet weight of manure per 1,000 pounds live weight animal per day as obtained from the literature (2) and also used in this report are given as follows: cattle - 64 pounds; hogs - 70 pounds; and sheep - 63 pounds.

PRESENTATION OF DATA

Appendix D - Table I gives general information on the 21 establishments included in the study and the sewer district available to each. The location of the meat plants is visually illustrated by Appendix D - Figure 1 and an accompanying insert to this figure. Data on the nature and degree of waste loads, abatement and treatment, as derived from industry officials and from visual observations made during plant visits, are summarized in Appendix D - Tables II through V.

Appendix D - Table II gives specific information on the total load of paunch contents experienced at the various plants, the type of separation facilities, and the means of final disposal for this waste at each site. Appendix D - Table III shows the size and type of holding pens,

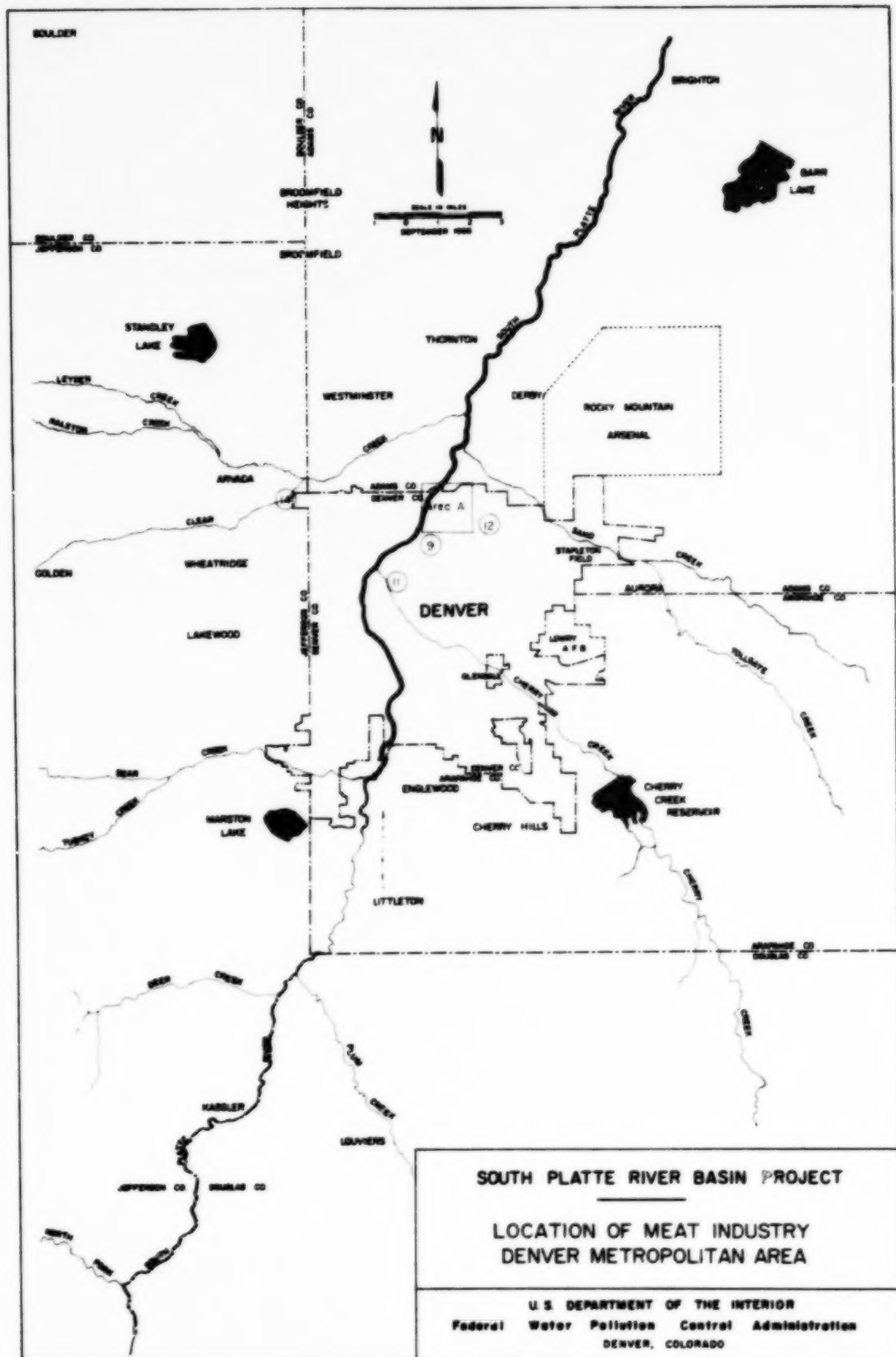
APPENDIX D - TABLE I

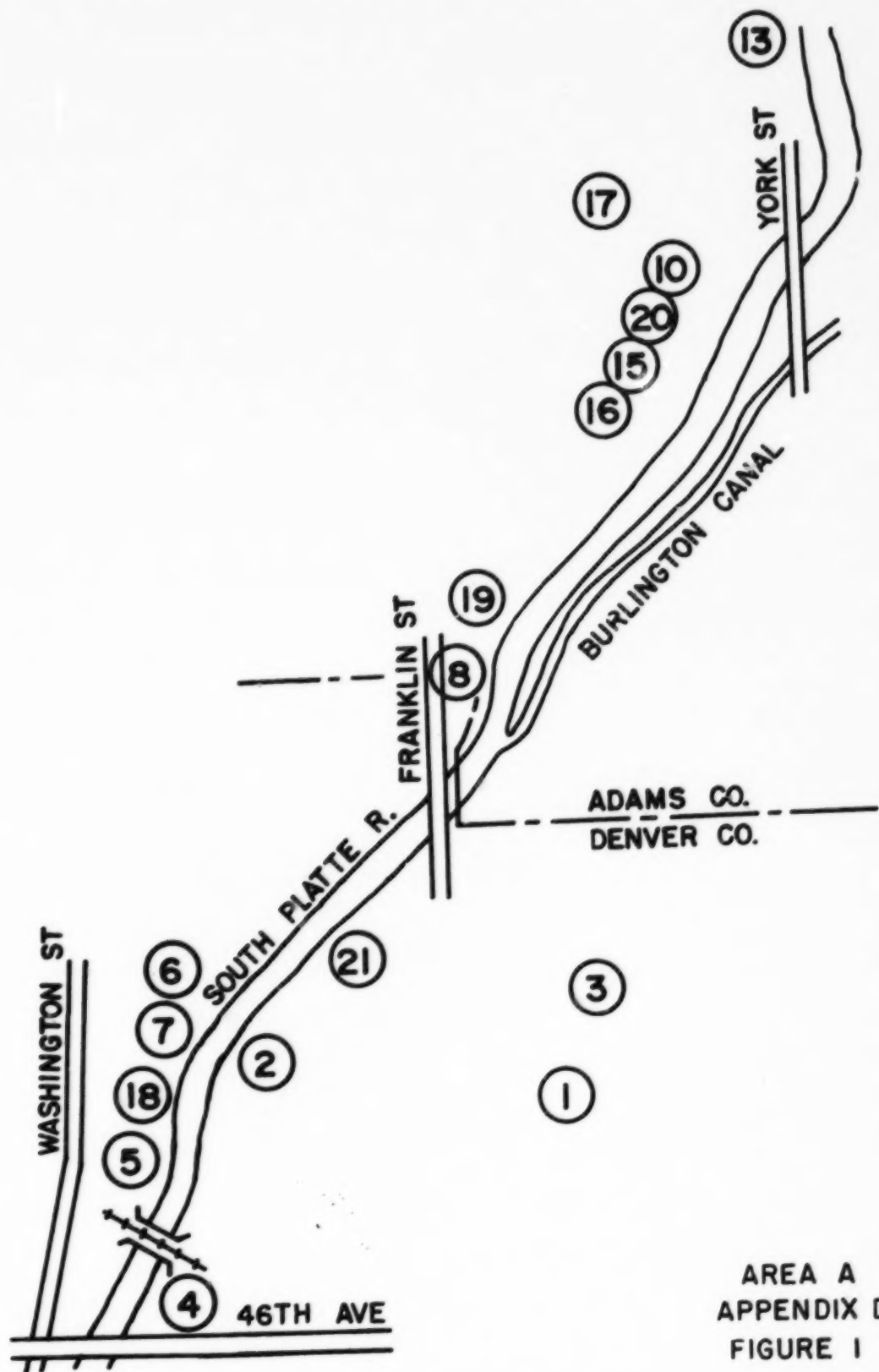
General Information on the Meat Industry Denver Metropolitan Area

Map Ident. No.	Plant	Type of Plant	Sewer District
1	Denver Union Stockyard Company	Stockyards	City and County of Denver
2	Swift and Company	Packinghouse	City and County of Denver
3	Cudahy Packing Company	Packinghouse	City and County of Denver
4	Pepper Packing Company	Slaughterhouse	City and County of Denver
5	Azmour and Company	Slaughterhouse	City and County of Denver
6	Capitol Packing Company	Slaughterhouse	City and County of Denver
7	Wilson and Company, Inc.	Slaughterhouse	City and County of Denver
8	United Fryer and Stillman, Inc.	Packinghouse	City and County of Denver
9	National Food Stores, Inc. (Denver)	Processing plant	City and County of Denver
10	National Food Stores, Inc. (Adams County)	Packinghouse	North Washington W & SD
11	Mapelli-Lindner- Sigman, Ltd.	Processing plant	City and County of Denver
12	Safeway Stores, Inc.	Processing plant	City and County of Denver
13	Litvak Meat Company	Packinghouse	North Washington W & SD
14	Sigman Meat Company, Inc.	Packinghouse	Clear Creek Valley SD
15	Altberger Packing Company	Slaughterhouse	North Washington W & SD

APPENDIX D - TABLE I (continued)
 General Information on the Meat Industry
 Denver Metropolitan Area

Map Ident. No.	Plant	Type of Plant	Sewer District
16	Bell Packers, Inc.	Slaughterhouse	North Washington W & SD
17	Denver Boneless Beef Company	Processing plant	North Washington W & SD
18	Adams Packing Company	Slaughterhouse	City and County of Denver
19	Denver Rendering Company	Rendering plant	City and County of Denver
20	Capitol Rendering Company	Rendering plant	North Washington W & SD
21	Meinerz Blood Dehydrating Company	Blood processing plant	City and County of Denver





AREA A
APPENDIX D
FIGURE 1

and the manner in which pen manure and spent livestock drinking water are disposed of. In Appendix D - Table IV, data is shown on the recovery of blood and meat and bone scraps together with the particular rendering operations receiving these materials. In certain cases, blood is completely wasted to the sanitary sewer. Lastly, the nature of grease removal facilities provided by the various plants is described in Appendix D - Table V.

DISCUSSION

Paunch Contents

There are 13 plants performing animal slaughtering operations in the Denver Metropolitan area. As shown by Appendix D - Table II these establishments experience and handle a total paunch manure load in the order of 125 tons per day. Ten plants provide some form of treatment and removal of paunch contents whereas three plants release all paunch manure to the sanitary sewers. Treatment facilities consist of screening in five plants, settling in three plants, screening followed by settling in one establishment, and dry removal utilizing chute conveyors in one plant. It is estimated under the best operating conditions that no more than 65 tons per day of paunch contents are removed by in-plant treatment. These collected solids are trucked to local farmers or fertilizer companies for final disposal on a pre-arranged basis. This study strongly indicates that under normal conditions, 50 percent or more of the paunch contents are discharged to the various sanitary sewers. The Denver Northside Sewage Treatment installation receives a minimum of 56 tons per day of paunch contents, and the North Washington Water and Sanitation District Sewage Treatment facilities accept a minimum of 4 tons per day. It is noted that both Denver and North Washington are members of the newly-established Metropolitan Denver Sewage Disposal District No. 1, which has current regulations prohibiting the future release of paunch contents into the sanitary sewers (3).

Manure and Spent Livestock Drinking Water from Holding Pens

The amounts of pen manure accumulating each day within the Denver Metropolitan area from the meat industry exclusive of feedlot operations, was estimated in the order of 200 tons. This figure was based upon the 1963 kill for cattle, hogs, and sheep (4), the weight of manure previously experienced from such animals on a daily basis (2), and an average of 1.5 days detention in the holding pens. The manure in most cases is collected and removed by mechanical means for delivery to local fertilizer companies or to farmers. The status of pen manure disposal is shown for 13 plants within the Denver area in Appendix D - Table III.

Spent livestock drinking water is discharged to the South Platte River from two plants as indicated in Appendix C - Table III. The Denver

APPENDIX D - TABLE II

Paunch Manure Loads, Separation, and Final Disposal for the Meat Industry
Denver Metropolitan Area

Map Ident. No.	Plant	Est. Loading Before In-Plant Treatment - Pounds/Day	In-Plant Separation		Disposal of Collected Solids
			Screens	Settling Tank	
<u>Plants With Removal</u>					
2	Swift and Company	26,400	1/16" Rotary	None	Ruedy Fertilizer Company <u>a/</u>
3	Cudahy Packing Company	17,200	20 mesh Vibrating	8'x8'x6'	Ruedy Fertilizer Company <u>a/</u>
5	Armour and Company	14,700	1/16" Rotary	None	Ruedy Fertilizer Company <u>a/</u>
6	Capitol Packing Company	34,600	None	6'x8'x6'	Farmers <u>a/</u>
7	Wilson and Company, Inc.	57,600	None	(2) 6'x10'x4'	Farmers <u>a/</u>
10	National Food Stores, Inc. (Adams County)	24,000	None	6'x6'x4'	E&H Fertilizer Company <u>b/</u>
13	Litvak Meat Company	3,000	20 mesh Vibrating	None	Farmers <u>b/</u>
14	Sigman Meat Company, Inc.	2,800	20 mesh Vibrating	None	Farmers <u>c/</u>
16	Bell Packers, Inc.	8,700	Dry Removal	---	Farmers
18	Adams Packing Company	6,200	1/2" Stationary	None	Ruedy Fertilizer Company <u>a/</u>
Total		195,200			

a/ Drainage discharged to City and County of Denver san. sewer.
b/ Drainage discharged to North Washington W & SD san. sewer.
c/ Drainage discharged to Clear Creek Valley SD san. sewer.

APPENDIX D - TABLE II (continued)
Paunch Manure Loads, Separation, and Final Disposal
for the Meat Industry - Denver Metropolitan Area

Map Ident. No.	Plant	Est. Loading Before In-Plant Treatment - Pounds/Day	In-Plant Separation		Disposal of Collected Solids
			Screens	Settling Tank	
<u>Plants Without Removal</u>					
4	Pepper Packing Company	13,500	None	None	All paunch wastes to City and County of Denver san. sewer.
8	United Fryer and Stillman, Inc.	36,000	None	None	All paunch wastes to City and County of Denver san. sewer.
15	Altberger Packing Company	1,600	None	None	All paunch wastes to North Washington W & SD san. sewer.
	Total	<u>51,100</u>			

APPENDIX D - TABLE III

Holding Pen Manure and Livestock Drinking Water from the Meat Industry
Denver Metropolitan Area

Map Ident. No.	Plant	Holding Pen Area - Thousand Square Feet				Disposal of Manure	Disposal of Livestock Drinking Water
		Total	Sheltered	Open	With Concrete		
1	Denver Union Stockyard Company	2452.0	662.0	1790.0	662.0	Race Ct. Fer- tilizer Company Ruedy Fertilizer Company	So. Platte River and san. sewer San. sewer
2	Swift and Company	20.0	2.0	18.0	18.0	Ruedy Fertilizer Company	San. sewer
3	Cudahy Packing Company	1.2	0.0	1.2	1.2	Ruedy Fertilizer Company	San. sewer
4	Pepper Packing Company	20.0	4.0	16.0	20.0	Ruedy Fertilizer Company and san. sewer	San. sewer
5	Armour and Company	120.0	0.0	120.0	0.0	San. sewer	So. Platte River and san. sewer
6	Capitol Packing Company	14.5	0.0	14.5	14.5	Farmers	San. sewer
7	Wilson and Company, Inc.	35.0	0.0	35.0	24.0	Farmers	San. sewer
8	United Fryer and Stillman, Inc.	27.0	0.0	27.0	27.0	Race Ct. Fer- tilizer Company	Ground
13	Litvak Meat Company	44.0	6.6	37.4	6.6	Farmers	San. sewer
14	Sigman Meat Company, Inc.	54.0	0.0	54.0	5.4	Farmers	Unknown
15	Altberger Packing Company	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
16	Bell Packers, Inc.	180.0	0.0	180.0	0.0	Ruedy Fertilizer Company	Ground
18	Adams Packing Company	20.0	2.0	18.0	2.0	Ruedy Fertilizer Company	San. sewer

Union Stockyard Company releases excess livestock drinking water and other waste flows to the River which comprise a large pollutional load (see plant report in Appendix C). Considerable improvement should be expected in disposing of solid and liquid wastes from the livestock holding pens within the Denver area.

Blood, Meat and Bone Scraps

Nearly all meat plants in the Denver area provide for the collection of blood, meat and bone scraps, and other miscellaneous from processing. The degree and efficiency of these collection programs are not known but probably vary from very good to poor. The recovered materials are sent to the rendering cookers. Many plants maintain their own rendering facilities whereas others transport the salvage materials to the Denver Rendering Company, the Meinerz Blood Dehydrating Company, or the Capitol Rendering Company. Data on individual plants is given in Appendix D - Table IV. This table also shows how the various establishments dispose of liquid wastes from the rendering operations. Three plants which include United Fryer and Stillman, Inc., the Litvak Meat Company, and the Capitol Rendering Company, discharge part or all of their rendering operation wastes to the South Platte River.

Grease

The large majority of meat plants provide some form of grease removal and recovery from the processing waste effluents. Data on individual establishments is given in Appendix C - Table V. Of the 15 plants for which information was available, only 3 plants failed to have any facilities for collection of grease. The overall picture nevertheless should be substantially improved. The waste detention times and associated skimming for grease removal were found to be marginal in a great number of plants, with excessive amounts of grease being discharged to the sanitary sewer and in certain cases to the South Platte River. The Altberger Packing Company is a special case in that all grease, blood, offal and paunch contents are discharged to the North Washington Water and Sanitation District sewers, contributing heavily to the overloaded condition of the District's sewage treatment plant (5).

APPENDIX D - TABLE IV

Blood, Meat and Bone Scraps from the Meat Industry
Denver Metropolitan Area

Map Ident. No.	Plant	Blood Rendered at		Meat and Bone Rendered at		Disposal of Rendering Plant Wastes
		Own Plant	Meinerz Company	Own Plant	Denver Rendering Company	
2	Swift and Company	X		X		City and County of Denver san. sewer.
3	Cudahy Packing Company	X		X		City and County of Denver san. sewer.
4	Pepper Packing Company		X		X	---
5	Armour and Company		X		X	---
6	Capitol Packing Company	X		X		City and County of Denver san. sewer.
7	Wilson and Company, Inc.					---
8	United Fryer and Stillman, Inc.	X	X	X		City and County of Denver san. sewer.
9	National Food Stores, Inc. (Denver)					---
10	National Food Stores, Inc. (Adams County)			X	X	City and County of Denver san. sewer. and to So. Platte River.
11	Mapelli-Lindner- Sigman, Ltd.	X	Unknown		Unknown	Unknown
12	Safeway Stores, Inc.		Small quantities of blood.			North Washington W & SD san. sewer.
13	Litvak Meat Company		Small quantities of blood.		X	---
14	Sigman Meat Company, Inc.				X	---
15	Altberger Packing Company			X		So. Platte River.
16	Bell Packers, Inc.		Blood wasted.		X	---
17	Denver Boneless Beef Company		Small quantities of blood.		X	---

APPENDIX D - TABLE IV (continued)
 Blood, Meat and Bone Scraps from the Meat
 Industry - Denver Metropolitan Area

Map Ident. No.	Plant	Blood Rendered at		Meat and Bone Rendered at		Disposal of Rendering Plant Wastes
		Own Plant	Meinerz Company	Own Plant	Denver Rendering Company	
18	Adams Packing Company	No blood rendered.	X	X	X	--- City and County of Denver san. sewer.
19	Denver Rendering Company					
20	Capitol Rendering Company	No blood rendered.		X		North Washington W & SD san. sewer and to So. Platte River.
21	Meinerz Blood Dehydrating Company	X	Same		---	City and County of Denver san. sewer.

APPENDIX D - TABLE V
Grease Loads, Separation, and Final Disposal for the Meat Industry
Denver Metropolitan Area

Map Ident. No.	Plant	Retention Tank	Skimming of Grease from Retention Tank	Disposal of Liquid Effluents
2	Swift and Company	(2) 5'x20'x6' 40'x12'x4'	Continuous	City and County of Denver san. sewer
3	Cudahy Packing Company	(2) (30'x2½'x5')	1x/day	City and County of Denver san. sewer
4	Pepper Packing Company	20'x6'x5'	1x/day	City and County of Denver san. sewer
5	Armour and Company	20'x12'x6½'	1x/day	City and County of Denver san. sewer
6	Capitol Packing Company	5'x8'x5'	1x/day	City and County of Denver san. sewer
7	Wilson and Company, Inc.	4'x40'x3'	1x/day	City and County of Denver san. sewer
8	United Fryer and Stillman, Inc.	15'x3'x2'	Continuous	City and County of Denver san. sewer
9	National Food Stores, Inc. (Denver)	Unknown	Unknown	City and County of Denver san. sewer and to So. Platte River
10	National Food Stores, Inc. (Adams County)	30'x11'x8½'	Continuous	City and County of Denver san. sewer
11	Mapelli-Lindner-Sigman, Ltd.	Unknown	Continuous	North Washington W & SD san. sewer
12	Safeway Stores, Inc.	Unknown	Unknown	City and County of Denver san. sewer
13	Litvak Meat Company	30'x10'x6'	Continuous	City and County of Denver san. sewer North Washington W & SD san. sewer and to So. Platte River

APPENDIX D - TABLE V (continued)
Grease Loads, Separation, and Final Disposal
for the Meat Industry - Denver Metropolitan Area

Map Ident. No.	Plant	Retention Tank	Skimming of Grease from Retention Tank	Disposal of Liquid Effluents
14	Sigman Meat Company, Inc.	8'x10'x6'	Continuous	Clear Creek Valley SD san. sewer
15	Altberger Packing Company	None	None	North Washington W & SD san. sewer
16	Bell Packers, Inc.	6'x4'x3½'	2x/day	North Washington W & SD san. sewer
17	Denver Boneless Beef Company	Unknown	Unknown	North Washington W & SD san. sewer
18	Adams Packing Company	None	None	City and County of Denver san. sewer
19	Denver Rendering Company	None	None	City and County of Denver san. sewer
20	Capitol Rendering Company	(2) 16'x2'x4' 10'x2½'x4½'	1x/day	North Washington W & SD san. sewer and to So. Platte River
21	Meinerz Blood Dehydrating Company	Unknown	Unknown	City and County of Denver san. sewer

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